hama, Japan, *November* 5th, 0h 57′, light shock; 10th, 1:47 a. m., light shock. Alajuela, Costa Rica, *November* 26th, 1;40 a. m., earthquake of short duration. Red Bluff, Cal., *December* 9th, 3:20 p. m., severe shock, lasting15 to 20 seconds, motion upward and downward. Flushing, N. Y., 24th, 9 p. m., slight shock from N. to to S., lasting five minutes and accompanied by a low, rumbling noise.

Sunsets.—The characteristics of the sky at sunset, as indications of fair or foul weather for the succeedings twenty-four hours, have been observed at all Signal Corps Stations. Reports from 103 stations show 3,173 observations to have been made of which 36 were reported doubtful; of the remainder 2,630 or 82.9 per cent., were followed by the expected weather.

Sun Spots.—Monthly record of observations by Mr. D. P. Todd, Nautical Almanac office, Washington D. C., communicated by Prof. S. Newcomb, U. S. Navy, in charge of that office:

Dec., 1878.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups	Spots.	Groups	Spots.	Groups	Spots.	Groups	Spots.	
6th, 4 p. m...	0	0	0	0	0	0	0	0	
11th, 2 p. m...	0	0	0	0	0	0	0	0	
12th, 2 p. m...	0	0	0	0	0	0	0	0	
13th, 3 p. m...	0	0	0	0	0	0	0	0	
16th, 2 p. m...	0	0	0	0	0	0	0	0	
18th, 4 p. m...	1	1	0	0	0	0	1	1	Faculæ; spot small.
19th, 2 p. m...	0	0	0	0	0	0	1	1	Faculæ.
24th, 3 p. m...	0	0	1	1	0	0	0	0	
28th, 2 p. m...	0	0	0	0	0	0	0	0	
30th, 2 p. m...	0	0	0	0	0	0	0	0	

Mr. Jay Harcourt, at Wappinger's Falls, N. Y., examined the sun on the following days, but observed no spots: 1st, 4th, 8th, 14th, 16th, 19th, 21st, 25th, 30th, 31st. Mr. David Trowbridge, at Waterburg, N. Y., examined the sun on the following days, but observed no spots: 1st, 2nd, 3rd, 5th, 6th, 8th, 12th, 13th, 18th, 22nd to 24th, 29th to 31st. Observations were also made at Ft. Whipple, Va., from the 20th to the 31st, and no spots observed.

NOTES AND EXTRACTS.

In the *American Journal of Science and Arts* for January, 1879, Professor Loomis publishes his Tenth Paper of "Contributions to Meteorology." With respect to storms of the Atlantic ocean, he has examined seventy-seven cases of low areas near the coast of the United States, and was able to follow thirty-six of them, with considerable confidence, entirely across the Atlantic Ocean, but eight of the storms became merged with other storms before reaching the European coast, leaving only twenty-eight low areas which reached the coast of Europe. Prof. Loomis examines the seventy-seven depressions, with respect to their first appearance, lowest isobars, respectively, in longitudes 60°, 30° and 0° W. of Greenwich; average velocities between those longitudes respectively, and the highest wind with the direction, on the English coast, at the approach of each low area. From his examination, he concludes:

"We see from this table that in one year there are on an average only eighteen different storms which can be traced by means of Hoffmeyer's charts from the coast of the United States across the Atlantic. If for each day we had two good charts, instead of only one, it is probable that a few more storms might be identified in their progress across the ocean, but it is doubtful whether the number would be greatly increased. Nearly all of these storms pursued a course north of east, and passed considerably to the north of Scotland. In only four of the cases did the low centre cross the meridian of Paris in a latitude as low as the northern boundary of England. The average track of the thirty-six low centres which are traced across the ocean, is shown by the means at the bottom of the table, where it is seen that the meridians of 60°, 30° and 0° were crossed in the latitudes 49°6, 58°.0 and 63°.3. Since the storm-centres generally passed 800 miles north of London, most of them did not exhibit much violence on the English coast. In half of the cases, the highest velocity reported was 3, denoting a very fresh breeze, and in only six of the cases was the velocity at any station on the English coast as high as 5, denoting a gale."

"We may hence conclude that when a centre of low pressure (below 29.5 inches) leaves the coast of the United States, the probability that it will pass over any part of England is only one in nine; the probability that it will give rise to a gale anywhere near the English coast is only one in six; and the probability that it will give rise to a very fresh breeze is one in two."

"One of the most noticeable circumstances connected with Atlantic storms is their slow rate of progress. This is due partly to the erratic cource of the centre of the low area, and partly to the frequent blending of two low areas into one, whence it generally results that the most eastern centre appears to be pushed backward toward the west. In my eighth paper I have described a remarkable example of this kind of movement. In like manner the storms numbered 35, 39, 41, 51, 53, 70 and 72 of the preceding table appeared to be pushed westward by blending with storms of subsequent date. Aside from this cause of detention, there seems in the Atlantic ocean to be a special cause which frequently holds storms nearly stationary in position from day to day, and this cause is probably the abundance of warm vapor rising from the Gulf stream, in close proximity to the cold dry air from the neighboring coast of North America. Hence we see that when American storms are predicted to appear upon the European coast, and it is assumed that they will cross the ocean at the same rate as they have crossed the United States, such predictions will seldom be verified."

"It will also be noticed that the storms which cross the Atlantic, generally increase in intensity after leaving the American coast; the average depression of barometer shown in the preceding table being 6 millimeters (0.24 inch) greater in long. 30° than in long. 60°."

Prof. Loomis also makes an examination of the barometer and winds at the base and summit of Mount Washington, and also compares the results with data obtained from adjoining stations, and draws the following conclusion:

"1. High winds on Mount Washington circulate about a low centre as they do near the level of the sea. 2. The motion of the wind is nearly at right angles to the direction of the low center. 3. The low centre at the height of Mount Washington sometimes lags behind the low centre at the surface of the earth apparently as much as two hundred miles."

In the latest edition of the *Encyclopædia Britannica*, William B. Carpenter, F. R. S., on the temperature of the Atlantic, holds that the deep-sea temperature sounding has justified the doctrine of a *vertical* oceanic circulation, sustained by opposition of temperature only, quite independent and distinct from the *horizontal* circulation produced by the winds. His views are expressed as follows:

"1. That instead of the local depressions of bottom-temperature imputed by previous writers to polar currents, the temperature of every part of the deep sea-bed in communication with either of the polar areas would be not many degrees above that of the polar areas themselves."

"2. That this general depression of bottom-temperature would be found to depend, not upon such a shallow glacial stream as might be maintained to be a return from the polar areas of water propelled towards them by wind-currents, but upon a creeping flow of the whole under-stratum, having a thickness of from 1000 to 2000 fathoms."

"3. That as the depression of bottom-temperature in any part of the general oceanic basin would be proportional to the freedom of communication between its deeper portion and that of one or other of the polar areas, the bottom-temperature of the South Atlantic would probably range downward to 32°, while that of the North Atlantic would not be below 35°, except where it first receives the Arctic flow, or comes under the influence of the Antarctic underflow, which would very probably extend itself to the north of the equator."

"4. That as the Arctic and Antartic underflows must meet at or near the equator, whilst the surface-stratum is there continually being draughted off thence towards either pole, there would be a continual ascent of glacial water under the line, showing itself by a nearer approach of cold water to the surface in the *inter*-tropical than in the *extra*-tropical zone."

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

Brig. Gen. (Bvt. Assg^{d}.) Chief Signal Officer, U. S. A.

Copy furnished for